



Medical Force Protection: Peru

Medical Force Protection countermeasures required before, during, and after deployment to Peru are as follows:

Major Threats

Food or Waterborne Disease: Poor sanitation throughout country including major urban areas. Local food and water are heavily contaminated with bacteria, viruses and parasites. **Presume local water sources are not safe for drinking.** Risks include Diarrheal diseases (viruses, Shigella, e.coli, Campylobacter and salmonella), hepatitis A, typhoid/paratyphoid fever, Brucellosis and hepatitis E. Enterotoxigenic E. coli diarrhea is prominent in Lima during the summer months. Campylobacter is very common in the port cities. Strains **resistant** to the standard therapeutic agents **fluoroquinolones**, **macrolides**, and **TMP/SMX** have been reported, particularly among Campylobacter spp

Vector-Borne Disease: Dengue fever is the major vector-borne disease and is found in the northern coastal regions as well as the eastern lowlands. It occurs year-round. Malaria is found throughout the country with the greatest risk of infection occurring at elevations below 1500 meters. Lima is free of malaria. The primary strain is P. vivax which accounts for 60% of the cases with P. falciparum and P. malariae accounting for the other 40%. Strains of falciparum malaria are **resistant** to the standard therapeutic agent **chloroquine**. Sporadic cases of cutaneous and mucosal leishmaniasis have been reported. Bartonellosis is found in the northern Andean valleys. Yellow fever can be found in small northern cities.

Water-Borne Disease: Leptospirosis poses a threat to troops directly exposed to bodies of water such as lakes, streams and irrigated fields. The organism is enzootic in the eastern and central lowlands.

Sexually Transmitted Disease: Gonorrhea, chlamydia, hepatitis B and HIV are present in Peru.

Respiratory Disease: Tuberculosis is sporadic and can be found throughout the country.

Animal Contact Disease: Rabies (primarily from stray dogs), Q fever and anthrax occur sporadically.

Requirements before Deployment

1. **Before Deploying report to Medical to:**
 - a. Ensure your Immunizations are up to date, specific immunizations needed for area: **Hepatitis A, MMR, Typhoid, Yellow fever, Tetanus (Td), and Influenza.**
2. **Malaria Chemoprophylaxis:** Risk in all departments except Arequipa, Moquegua, Puno, and Tacna. Travelers who visit the city of Lima or the highland tourist areas (Cuzco, Machu Picchu, Lake Titicaca) are not at risk. Begin if exposure anticipated.
 - a. **Mefloquine (Non-aviators only):** 250 mg per week, begun 2 weeks prior to entering Peru and continuing for 4 weeks after departure. **OR**
 - b. **Doxycycline (approved in flight status):** 100 mg per day, begun 2 days prior to entering Peru and continuing for 4 weeks after departure.
 - c. **Must include Primaquine terminal prophylaxis** (see "Requirements after deployment")
3. **Get HIV, PPD testing if not done in the past 12 months. G6PD status must be confirmed.**
4. **Obtain Adequate Personal Protective Supplies:** DEET anti-arthropod skin lotion must be issued and used by all personnel. Permethrin treatment is highly recommended for all field uniforms and bed nets. Sunscreen, lip balm, and hearing protection should be used as needed.
5. **Complete pre-deployment health assessment (DD Form 2795)*** per NEHC TM 6490.00-1 (<http://www-nehc.med.navy.mil/prevmed/epi/depsurv.htm>) The form can be downloaded from the website: http://amsa.army.mil/deploy_surv/DD2795_Pre_Deploy.pdf.

Requirements during Deployment

1. Deploy appropriate Preventive Medicine personnel and equipment.
2. Consume food, water, and ice only from US-approved sources; **"Boil it, cook it, peel it, or forget it"**.
3. Involve preventive medicine personnel with troop campsite selection.
4. Operate messing facilities in accordance with service directives. Ensure hand-washing facilities near messing facilities.
5. Operate latrine facilities in accordance with service directives. Ensure hand-washing facilities near latrine facilities.
6. Practice good personal hygiene, hand-washing, and waste disposal.
7. Avoid sexual contact. If sexually active, use condoms.
8. Use DEET and other personal protective measures against insects and other arthropod-borne diseases. Personal protective measures include but are not limited to proper wear of uniform, use of bed nets, and daily "buddy checks" in tick and mite infested areas.
9. Continue malaria chemoprophylaxis. Command supervision necessary to ensure accountability for anti-malarial medications.
10. Perform vector surveillance and control as needed, particularly during rainy months when mosquito vectors breed.
11. Conduct DNBI surveillance per NEHC TM 6490.00-1 (<http://www-nehc.med.navy.mil/downloads/prevmed/weeklydnbi.pdf>)
12. Minimize non-battle injuries by ensuring safety measures are followed. Precautions include hearing and eye protection, adequate

water consumption, suitable work/rest cycles, and acclimatization to environment and stress management.

13. Eliminate food/waste sources that attract pests in living areas.
14. Avoid contact with animals and hazardous plants.
15. Consider **Acetazolamide (Diamox) 250 mg every 6 – 12 hours** for 1 – 2 days before ascent and continued for 48 hours **if traveling to elevations >2,500 meters**.

Requirements after Deployment

1. If malaria chemoprophylaxis initiated then continue chemoprophylaxis as described above.
2. If performing malaria chemoprophylaxis: begin **terminal prophylaxis** (for both chemoprophylaxis regimens): **Primaquine** 15 mg per day for 14 days starting on day of departure from Peru. **G6PD status must be determined prior to starting Primaquine.**
3. Receive preventive medicine debriefing after deployment.
4. Seek medical care immediately if ill, especially with fever.
5. Get HIV and PPD testing as required by your medical department or Task Force Surgeon.
6. **Complete post-deployment health assessment (DD Form 2796)*** per NEHC TM 6490.00-1 (<http://www-nehc.med.navy.mil/prevmed/epi/depsurv.htm>). The form can be downloaded from the website: http://amsa.army.mil/deploy_surv/DD2796_Post_Deploy.pdf

* Mail completed original copy of DD 2795 and 2796 to: Army Medical Surveillance Activity, Building T-20, Room 213 (Attn: Deployment Surveillance), 6900 Georgia Ave, N.W., Washington D.C. 20307-5001

VECTOR RISK ASSESSMENT PROFILE (VECTRAP): Peru

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1. GEOGRAPHY: **Area** - 1.28 million sq. km. (496,222 sq. mi.); three times larger than California. **Capital City** - Lima (pop 6 million). **Terrain** - Western coastal plains, central rugged mountains (Andes), eastern lowlands with tropical jungle forests. **Climate** - Coastal area arid and mild; Andes temperate to frigid; eastern lowlands, tropically warm and humid.

2. VECTOR-BORNE DISEASES:

a. **MALARIA:** Malaria is highly endemic in rural areas below 1500 meters in northwest, northeast, and eastern Peru, including the Departments of Ayacucho, Cajamarca, Junin, Madre de Dios, and San Martin. Some risk may exist at elevations above 2,000 meters in Ancash Department. *Plasmodium vivax* (99% of all cases), *P. falciparum* (0.5% of cases) and *P. malariae* (0.5% of cases) are all reported. However, falciparum malaria may be more common in the extreme northwest portion of the country. *P. malariae* may be the predominant species in some foci in southeastern Junin Department.

Reported annual case totals declined from 39,122 in 1987 to approximately 32,000 in 1989, the first such decline since incidence had began to increase in 1981. Most cases are reported from Piura Department, and infection rates may exceed 25 percent in some areas along the Peru-Ecuador border. In mid-1990, vivax malaria was reported from 3 residents of Monterrico on the southeastern outskirts of Lima.

Chloroquine-resistant *P. falciparum* presumably is endemic in the departments bordering Brazil, and the proportion of drug-resistant cases reportedly was increasing in Apurimac and Cusco Departments in late 1990. Fansidar resistance, not currently reported from Peru, has been reported from neighboring countries. Fansidar resistance is not currently reported.

The risk of acquiring malaria is considered high without the proper chemoprophylaxis and would result in a serious loss of combat effectiveness.

b. **Dengue:** Likely endemic. Risk is presumably year-round in coastal and lowland urban areas where populations of the mosquito vector are present. Unconfirmed reports indicated that an extensive (100,000 to 150,000 cases) outbreak occurred in the vicinity of Iquitos, Loreto Department, during April and May 1990. As with most Latin American countries, the potential for major dengue outbreaks is substantial and the mosquito vector, *Aedes aegypti*, is widespread in Peru.

c. **Yellow Fever** is present at a low level of endemicity and the incidence in humans appears to be cyclic. The disease re-emerged with dramatic force in 1995, causing the largest outbreak in the country's history. Nearly 400 cases were reported, with a case-fatality rate approaching 50%. It is enzootic in the Departments of Ayacucho, Cuzco, Huanuco, Junin, Loreto, Madre de Dios and San Martin; most cases occur at elevations of 400 to 1,000 meters, with risk elevated from December through June; incidence tends to be cyclic. All cases appear to be sylvatic, but the presence and abundance of *Aedes aegypti* in many cities of the endemic area make a transition to the urban cycle a possibility. Up through the end of May 1999, 7 cases of yellow fever have been reported with 3 deaths in the Junin Department. Other Departments reporting cases are San Martin, in the districts of Moyobamba, Jepelacio and Alonso de Alvarado (26), Ayacucho in the province of La Mar, district of Anco y Santa Rosa (12), and Huanuco(5). Of these a total of 13 cases have been confirmed. An acute illness in 1995 that resulted in at least 77 cases (17 fatal) in extreme northern Cuzco Department (about 300 kilometers northwest of the city of Cuzco) was under investigation by health authorities. A regional hospital director indicated that yellow fever was a possible cause of the outbreak, claiming that the disease was "common in the area." Peru reported a total of 55 cases with 32 deaths in 1999.

d. **Mayaro virus fever:** Enzootic level and distribution are unclear; serological evidence of risk east of the Andes. Mosquito-borne disease that may be mistaken for dengue fever because of similarities in symptoms and transmission.

e. **Ilheus virus fever:** Mosquito-borne, reportedly occurs in the Amazonian lowlands (serological evidence of foci in eastern San Martin Department).

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f. Other **Arboviral encephalitides**: Transmitted by the bite of an infective mosquito (several genera), these zoonotic agents usually circulate erratically with only occasional incidental human infections. **Eastern equine encephalitis**, **Western equine encephalitis**, **Venezuelan equine encephalitis** (enzootic in the Amazonian lowlands, with outbreaks occasionally occurring in the drier Pacific areas), and **St. Louis encephalitis** (human cases reported) have been reported from Peru.

g. **Plague**: Plague is endemic in northwest Peru. According to a late July 1994 report, 420 cases (19 fatal) had occurred during January 1994 to May 1994, bringing the cumulative total since the outbreaks began during October 1992 to 1,299 cases (62 fatal). These outbreaks, which reportedly had begun in Cajamarca Department and subsequently spread to Lambayeque, La Libertad, and Piura Departments, now are the most extensive to affect Peru at least since the mid-1960s. As of late July 1994, "control measures" were underway in the outbreak areas. However, because of the inherent difficulties in controlling Plague Epizootics, risk from plague likely will remain elevated in Northern Peru at least for the near term. If contracted, plague would cause significant reductions in combat effectiveness.

h. **Epidemic typhus (LOUSE-BORNE)**: Epidemic typhus occurs in the cooler areas in the Andes Mountains in the southern part of the country (Cuzco, Puno). In the event of a military conflict in endemic areas, the potential for a large-scale epidemic would be tremendously enhanced. In the absence of any conflict, the risk to U.S. troops is low if they are kept isolated from the indigenous population. The greater the interaction with native groups, the higher the risk. Combat readiness would be severely impaired with an outbreak of this disease.

i. **Bartonellosis**: (Oroyo fever) is scattered throughout the Andean villages in valleys between 1000 and 3000 meters in elevation. It is most common in the departments in the center of the country, just east of Lima.

j. **Cutaneous leishmaniasis**: It is widespread in the country, especially in the jungles on both sides of the mountains. It does not seem to be a problem in coastal cities, however. Presumably limited to the Andean Cordillera and eastward, risk greatest in the eastern foothills and the Amazonian lowlands. Espundia (mucocutaneous manifestation) usually is occupationally associated (forestry) and does not occur at elevations above 800 meters. A form of cutaneous leishmaniasis called "uta" (caused by *L. braziliensis peruviana*) appears restricted to the western slopes and valleys of the Andean region between 600 and 3,000 meters altitude. Reportedly, some 10,000 inhabitants of Huanuco department were suffering from uta in late 1990. Diffuse cutaneous leishmaniasis, caused by *L. mexicana*, recently was reported from Junin Department. Mucocutaneous leishmaniasis is found in the Amazon jungle east of the Andes.

k. **Chagas' Disease**: It is focally distributed in rural areas - primarily in the southern half and northern quarter of the country. Nearly 40 percent of Peruvians considered at risk.

l. **Tick-borne Relapsing Fever** is endemic in the mountainous areas in the center of the country, but incidence is very low.

m. **Venezuelan Equine Encephalitis** and **Eastern Equine Encephalitis** outbreaks occur in 7-8 year cycles along the northern coasts with several human cases reported. The risk of acquiring any of these diseases is considered low if the proper precautions are taken. NOTE: If contracted, Bartonellosis, Relapsing Fever, or Encephalitis would all cause significant reductions in combat effectiveness.

n. Reports of **rabies** have come out of the De Dios Department in southeastern Peru. Several human deaths occurred in the vicinity of Yutupis, northern Amazonas Department. All cases reportedly had been contracted through bites from rabid vampire bats, and Yutupis is in the general vicinity of an earlier vampire bat associated rabies outbreak.

3. DISEASE VECTOR INFORMATION:

a. **MALARIA**: Eight of the 31 Anophelines present in the country are confirmed vectors of malaria. These include: *A. pseudopunctipennis*, *A. punctimacula*, *A. albimanus*, *A. rangeli*, *A. benarrochi*, *A. oswaldoi*, *A. trinkae*, and *A. darlingi*. Which species is the primary vector depends largely on what elevation you are at. *Anopheles pseudopunctipennis* is responsible for transmission at elevations up to 2400 meters. *Anopheles darlingi* is the primary vector in the lowlands of the Amazon jungle. Transmission generally occurs in the summer months, from December to April, but in the northern jungles it could be year-round. *Anopheles pseudopunctipennis* is reportedly resistant to DDT, Dieldrin, and Lindane.

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- b. DENGUE & YELLOW FEVER: The mosquito *Aedes aegypti* is the principal vector of Dengue and urban Yellow Fever. Sylvatic Yellow Fever is transmitted to man by *Haemagogus* sp. or *Sabethes* sp. mosquitoes. *Aedes aegypti* is a container-breeding mosquito and thrives around human habitations in practically any container that holds water. *Haemagogus* and *Sabethes* mosquitoes are forest dwellers that circulate the virus between monkeys. Man is an incidental host for these species.
- c. PLAGUE: The vectors of plague are the fleas *Xenopsylla cheopis* and *Pulex irritans*. *Pulex irritans* is reportedly resistant to DDT.
- d. EPIDEMIC TYPHUS: The body louse, *Pediculus humanus*, is the vector of louse-borne typhus. High louse densities among the local populace can be expected. Crowded living conditions during times of conflict can further aggravate this situation. Body lice can be transferred from one person to another through the sharing of infested clothing. Body lice are reported to be resistant to DDT.
- e. Vectors of Chagas' disease are the Kissing bugs, *Triatoma infestans* and *Panstrongylus herreri*.
- f. The sand flies *Lutzomyia peruensis* and *L. verrucarum* are the vectors of Leishmaniasis and Bartonellosis.
- g. Soft ticks of the genus *Ornithodoros* are the vectors of Tick-borne Relapsing Fever, probably *O. talaje* or *O. venezuelensis*.
- h. Several mosquito species are capable of vectoring viral encephalitides to man; in Peru the vectors probably include *Culex nigripalpus* and *Aedes taeniorhynchus*.
- i. Vampire bats (genus unknown) have been attributed with the spread of rabies that resulted in several fatalities. Vampire bats are a major reservoir for rabies in areas of South and Central America.

4. DISEASE AND VECTOR CONTROL PROGRAMS:

- a. Prevention and Control: Malaria chemoprophylaxis should be mandatory. Consult the Navy Environmental Preventive Medicine Unit #2 in Norfolk, VA (COMM: 757-444-7671; DSN: 564-7671; FAX: 757-444-1191; PLAD: NAVENPVNTMEDU TWO NORFOLK VA) for current chemoprophylaxis recommendations.
- b. Yellow Fever immunizations should be current.
- c. The conscientious use of personal protective measures will help to reduce the risk of many vector-borne diseases. The most important personal protection measures include the use of DEET insect repellent on exposed skin, wearing permethrin-treated uniforms, and wearing these uniforms properly. The use of DEET 33% lotion (2 oz. tubes: NSN 6840-01-284-3982) during daylight and evening/night hours is recommended for protection against a variety of arthropods including mosquitoes, sand flies, other biting flies, fleas, ticks and mites. Uniforms should be treated with 0.5% permethrin aerosol clothing repellent (NSN 6840-01-278-1336), per label instructions. NOTE: This spray is only to be applied to trousers and blouse, not to socks, undergarments or covers. Reducing exposed skin (e.g., rolling shirt sleeves down, buttoning collar of blouse, blousing trousers) will provide fewer opportunities for blood-feeding insects and other arthropods. Additional protection from mosquitoes and other biting flies can be accomplished by the use of screened eating and sleeping quarters, and by limiting the amount of outside activity during the evening/night hours when possible. Bednets (insect bar [netting]: NSN 7210-00-266-9736) may be treated with permethrin for additional protection.
- d. In plague-endemic areas, rodent control should be implemented only after satisfactory flea control has been accomplished. Frequent bathing and laundering clothing in hot water will aid in the prevention and/or control of body lice.
- e. The most important element of an *Aedes aegypti* control program is SOURCE REDUCTION. Eliminating or covering all water holding containers in areas close to human habitation will greatly reduce *A. aegypti* populations. Alternatively, containers may be emptied of water at least once a week to interrupt mosquito breeding. Sand or mortar can be used to fill tree holes and rock holes near encampments.
- f. Because the breeding habitats of most sand fly species are not easily identified, not easily accessible, or unknown, control strategies focus mainly on adult sand flies. Spraying residual insecticides on buildings, (including screening on portals of entry) animal shelters, and other adult resting sites can control Peridomestic sand fly species. Area chemical control of sylvan sand fly species is impractical. Personal protective measures will reduce sand fly bites and environmental modification (e.g., clearing forests, eliminating

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rodent burrows/breeding sites, relocating domestic animals away from human dwellings) has been used to reduce local sand fly populations.

g. Expanded Vector Control Recommendations are available upon request.

5. IMPORTANT REFERENCES:

Contingency Pest Management Pocket Guide Technical Information Memorandum(TIM)24. Available from the Defense Pest Management Information Analysis Center (DPMIAC) www.afpmb.org/pubs/tims/ (DSN: 295-7479 COMM: (301) 295-7479). Best source for information on vector control equipment, supplies, and use in contingency situations.

Control of Communicable Diseases Manual-Edited by James Chin. Seventeenth Ed. 2000. Available to government agencies through the Government Printing Office. Published by the American Public Health Association. Excellent source of information on communicable diseases.

Medical Environmental Disease Intelligence and Countermeasures-(MEDIC). January 2002. Available on CD-ROM from Armed Forces Medical Intelligence Center, Fort Detrick, Frederick, MD 21702-5004. A comprehensive medical intelligence product that includes portions of the references listed above and a wealth of additional preventive medicine information.

Internet Sites- Additional information regarding the current status of vector-borne diseases in this and other countries may be found by subscribing to various medical information sites on the internet. At the Centers of Disease Control and Prevention home page subscriptions can be made to the Morbidity and Mortality Weekly Report(MMWR)and the Journal of Emerging Infectious Diseases. The address is www.cdc.gov. The World Health Organization Weekly Epidemiology Report (WHO-WER) can be subscribed to at www.who.int/wer. The web site for PROMED is <http://www.promedmail.org/>.

Although PROMED is not peer reviewed, it is timely and contains potentially useful information. The CDC and WHO reports are peer reviewed. Information on venomous arthropods such as scorpions and spiders as well as snakes, fish and other land animals can be found at the International Venom and Toxin Database website at <http://www.kingsnake.com/toxinology/>. Information on anti-venom sources can also be found at that site. Information on Poisonings, Bites and Envenomization as well as poison control resources can be found at www.invivo.net/bg/poison2.html.

USERS OF THIS VECTRAP: Please notify NDVECC Jacksonville, or the appropriate NEPMU, if you acquire any medical entomology information that can be used to update this VECTRAP.

CUSTOMER SURVEY: In order to improve our VECTRAPs we would like your opinions on the quality and quantity of information contained in them. Please take time to fill out the survey which is contained as an attachment and Fax or e-mail your response back to us. Thank you for your cooperation.

ADDITIONAL INFORMATION ON DISEASE VECTOR SURVEYS, CONTROL AND SPECIMEN ID's WILL BE PROVIDED UPON REQUEST.